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A BOTTOM TRAWL SURVEY FOR CRABS IN THE SOUTHERN,  
KAMISHAK AND BARREN ISLANDS DISTRICTS OF THE COOK INLET  
MANAGEMENT AREA, JUNE 18 - JULY 10, 1995.

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## INTRODUCTION

The department has been conducting trawl surveys for red king (Paralithodes camtschaticus) and Tanner (Chionoecetes bairdi) crabs in the Cook Inlet Management Area since 1990. The data from these surveys are used in part to generate crab population estimates. The population estimates in turn are utilized to set the quotas for the commercial fisheries.

The trawl survey replaced the pot index that was employed by the department prior to 1990 to assess the crab stocks. The pot survey data were used to establish an index of abundance which was subsequently related to commercial catch information. The shortcomings of the pot survey, such as soak variation, dependence on the commercial fishery, and the relative nature of the indices themselves, induced the Department to employ a trawl survey that would eliminate the influence of these variables and allow direct stock enumeration.

Historically trawl surveys have been operated by both the National Marine Fisheries Service (NMFS) in the Bering Sea and the Department of Fish and Game (ADF&G) in the Westward Region. Data from these surveys have proven satisfactory in determining stock conditions and resultant fisheries management strategies for king and Tanner crabs.

Many species of groundfish are captured during the trawl survey. Enumerating the catch was inconsistent for the first few years of the survey. Beginning in 1993 the regional research biologist has regularly participated in the trawl survey, therefore, providing a vehicle for groundfish data collection and analysis, which are documented in another report series.

## OBJECTIVES

The 1995 survey goals were:

1. Determine abundance of Tanner and red king crab stocks in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area (Figure 1). Also, determine abundance of that segment of the Dungeness crab (Cancer magister) stock inhabiting the survey stations.
2. Document the size and shell age of all Tanner, king, and Dungeness crabs captured. Determine egg condition of all female crabs.
3. Documentation, including age, size and weight, of key groundfish species such as Pacific Cod (Gadus macrocephalus), pollock (Theragra chalcogramma), all rockfish species (Sebastes spp.) and sablefish (Anoplopoma fimbria). These data are reported in a separate data report series.
4. Record bottom water temperatures at randomly selected stations.

## METHODS

### Trawl and Area Description

The state research vessel Pandalus, overall length 66 feet, was utilized to conduct the survey. A 400 mesh eastern trawl was fished with 800 pound, 5'x 7', Nor'Eastern Astoria V trawl doors. Headrope and footrope lengths were 70 and 95 feet, respectively.

The estimated fishing height and width were 9 and 40 feet, respectively. The trawl had 4.0 inch mesh in the wings and body, 3.5 inch in the intermediate and cod end, and a 1.25 inch cod end liner.

Selection of the general survey areas was based on historical pot indices, commercial catch information, and preceding trawl survey results. Geographic areas that had a very limited probability of crab catch were not selected. The two general locations chosen were: 1) that portion of the Southern District from upper Kachemak Bay extending west to 152 degrees W. longitude, and 2) the Kamishak and Barren Islands Districts (referred to as Kamishak District) as far east as 152 degrees 40 minutes W. longitude (Figure 1).

### Sampling Methods

Actual station sizes were initially based on those dimensions utilized in the Westward Region. Bay stations (Southern District) were 2.5 nautical miles square (6.25 sq. m.) (Figure 2) and ocean stations (Kamishak and Barren Islands) were 5.0 nautical miles square (25.0 sq. m.) (Figure 3). Station size and shape varied somewhat based on irregular coastline and depth. Depths shallower than 10 fathoms were always precluded from station selection. Southern District bay stations were further stratified by depth to isolate the deep water (between 50 and 90 fathoms) which essentially runs from Gull Island to Barabara Point. Furthermore, individual station dimensions were re-evaluated annually, occasionally resulting in an increase or decrease in size. These re-evaluations were based on previous surveys and commercial fishery data.

Initial goals for tow length and time were 1.0 nautical miles and 30 minutes, respectively.

If irregular bottom or trawl hangups caused reduction in fishing duration, only data from tow lengths of 0.5 nautical miles or greater were used. The data from shorter tows were discarded and the tows repeated. Data from tows that caught pots were sometimes used.

This was the result of subjective decisions made by the staff after evaluating the effect of the pot on the fishing characteristics of the net. The trawl path was randomly selected



within the station grid by the vessel skipper wherever it appeared that a good tow could be made. All tows were made during daylight hours.

Successful tows were brought aboard and weighed. All male king, Tanner, and Dungeness crabs were weighed and measured. All female kings crabs were sampled; however, a one basket subsample of female Tanners and Dungeness was taken when the catches of these animals were large. Width measurements were used for Tanner and Dungeness crabs while length was utilized for king crabs. Shell age and egg condition information was recorded.

Finfish catches, including Pacific cod, pollock, sablefish, and rockfish, were sampled by the Regional Groundfish Biologist. These data will be described in a separate Regional Information Report.

A data logger, which recorded temperature, was deployed once per day on randomly selected tows.

#### Data Analysis

Abundance estimates for king and Tanner crabs in each district were generated using the following area swept equation:

$T = 151.9 (A) (C)$  where 151.9 is a factor to convert catch per nautical mile towed to catch per square nautical mile.  $(151.9 \times 40 \text{ [fishing width of the net]} = 6,076 \text{ feet [one nautical mile]})$ .

T = the estimated total number for each species.

A = the area of the station in square nautical miles.

C = the catch per tow in number of crabs.

These data were calculated for each station which in turn were summed to yield an estimate for the district. All untowed stations were assumed to have no crabs.

## **RESULTS**

### General

A total of 47 good tows were made from June 18 through July 10, 1995. Four tows were shortened due to net hangups. The number of stations fished in the Southern and Kamishak/Barren Islands Districts were 20 and 27, respectively. Total catches of all species and debris were 46,108 lb in the Southern District and 21,860 lb in the Kamishak/Barren Islands Districts (Appendices A and B).

Bottom temperatures taken from a recording device attached to the headrope of the trawl are reported for both districts in Appendix C.

### Southern District

Crab catches for the Southern District were 3,321 pounds of Tanners, 42 pounds of king crabs, and 274 pounds of Dungeness. The total catch of all other species and debris was 42,471 pounds (Table 1).

A total of 2,743 male Tanner crabs were caught. The majority (87%) were sublegals (<140 mm). True prerecruit two's constituted the largest group of males captured (26%). True prerecruit ones comprised 22 percent of all the males caught. True prerecruits and recruits are new shells in the respective size classes. The legal male catch was 13 percent (366) of all age classes combined. True recruits constituted 67 percent of the legal male catch (Table 2 and Figure 4). The average width of the legal males was 151 mm (5.94 inches).

A total of 1,833 female Tanner crabs were caught. Of these, 833 (45%) were juveniles and the remaining 1,000 were adults. Of the adult females, 954 (95%) had full clutches. Only 14 adults were barren; 11 of these were very old shells. Of the adult females, 878 (88%) were newly mature (Table 3 and Figure 5). All eggs were uneyed.

King crabs were found in 3 of the 20 stations towed. Three male king crabs were caught. All were legal; 1 recruit and 2 postrecruits (Table 4). One female king crab was captured and it was an adult bearing a partial clutch of uneyed eggs (Table 5).

The male Dungeness catch totaled 159 crabs. The average width was 138 mm and sizes ranged from 104 to 186 mm (Figure 6). Ten (6%) of the males were legal. Of the 10 legals, 5 (50%) were true recruits. Of the 149 sublegals, 49 were prerecruit ones, 98 were prerecruit twos, and 2 were prerecruit threes. Skipmolts accounted for only 3 (6%) of the prerecruit ones, and one (1%) of the prerecruit twos (Table 6). Softshells consisted of 22 (14%) males, 2 of which were legal .

The female Dungeness catch numbered 155 animals. The average width was 139 mm and sizes ranged from 107 to 170 mm (Figure 7). Of the 154 females, 113 (90%) were new shells and the remainder were skipmolts. Ten were bearing eggs, 8 new shells and 2 old shells (Table 7). Of the 10 egg bearing females, 9 clutches were uneyed and 1 was eyed. Thirteen (8%) of the total were softshells. Juvenile females could not be identified because there are no external indicators of sexual maturity other than the presence of eggs.

#### Kamishak and Barren Islands Districts

Crab catches in the Kamishak and Barren Islands Districts were 1,041 pounds of Tanners and 28 pounds of king crabs. No Dungeness crabs were caught. The total catch of all other species and debris was 20,791 pounds from 27 tows (Table 8).

A total of 1,105 male Tanner crabs were caught. Sublegals dominated the catch with 94 percent (1,039) of the males captured. Of the 66 legal males, 48 (73%) were true recruits. Numbers of true prerecruit ones and twos were evenly distributed at 238 and 290 crabs, respectively. Prerecruit three numbers dropped to 138 crabs. Skipmolts made up a significant percentage of the prerecruit ones and twos with 229 (49%) of the ones and 132 (31%) of the twos (Table 9 and Figure 8). The average width of the legal males was 146 mm (5.75 inches). Black mat was not found on any Tanner crabs of either sex.

A total of 196 female Tanner crabs were caught. Of these, 59 were juveniles and 137 were adults. Newly mature females accounted for 98 (72%) of the adults (Table 10 and Figure 9).

Six male king crabs were captured, 3 legals and 3 sublegals (Table 11). Four juvenile female king crabs were caught (Table 12).

#### Tanner Crab Population Estimates

For the Southern District, Tanner crab population estimates of catchable males and females were 1,853,639 and 1,285,929 crabs, respectively. Estimates for the Kamishak and Barren Islands District were 3,665,697 males and 675,421 females. The estimates of legal male Tanner crabs were 235,319 for the Southern District and 243,330 for the Kamishak/Barren Islands Districts (Table 13). True recruits composed 67 percent of the legal males in the Southern District, and 71 percent in the Kamishak and Barren Islands Districts.

#### King Crab Population Estimates

The population estimate of catchable male king crabs in the Southern District was 1,602. The estimate of catchable females was 304 crabs. (The term “catchable” is used here

because juvenile king crabs may not inhabit trawlable bottom in the Southern District; therefore, they are not catchable.)

The Kamishak/Barren Islands Districts' catch yielded a population estimate of 23,806 males and 13,886 females.

## **DISCUSSION**

### King crab

Compared to historical commercial catch figures, which only reflect the number of legal males, the overall population level of king crabs remains severely depressed in both the Southern and Kamishak/Barren Islands Districts. For example, the mean commercial catch prior to the final 1984 closure was 3.44 million pounds per year. Assuming an average weight of 6.5 pounds per crab, the 3.44 million pounds equal approximately 530,000 legal males. This compares to a 1995 total male population estimate of 25,408 crabs, or 5 percent of the historical mean commercial catch.

### Tanner crab

#### Southern District

The 1990 through 1992 trawl surveys in the Southern District indicated that the Tanner crab stock was staging a modest recovery from documented lows (Figure 10). Limited commercial fisheries were permitted from 1991 through 1994 (Table 14). The surveys also showed that the improvement would be followed by another downturn in abundance.

The reduced recruitment identified by the 1993 and 1994 surveys were representative of this decline (Figure 10).

There was a substantial increase in overall male numbers from 1994 to 1995 (Figure 11). The 1995 data, however, show an increase in almost all size classes. Even if natural mortality was zero, which is not possible, this interannual increase could not have occurred unless there was immigration into the Kachemak Bay stock. This type of movement has never been documented by tag recovery, survey, or fishery data. Another explanation of the overall increase from 1994 to 1995 is that either or both of the surveys were flawed. Review of 1990 through 1993 survey data reveals an unexpectedly sharp drop in abundance in 1994. Although there are few size classes available for substantial comparison, it appears that the prerecruit fours in 1993 correlate with the prerecruit twos in 1995. The prerecruit threes are the dominant size class in the 1994 data, but the numbers show a sharp drop from 1993 and an equally sharp increase in 1995 (Figure 12). It seems, therefore, that the 1994 survey likely underestimated the Kachemak Bay Tanner stock. Because the survey design changed only slightly, it appears that the explanation lies in either an insufficient number of stations, or some problem in the mechanics of the trawling itself.

Assuming that the 1995 data fairly represent the stock abundance, it appears that recruitment into the adult male segment of the stock increased substantially over the past 2 years. Although legal numbers remained low, the increased numbers of prerecruit ones and twos (perhaps represented by a single age class), does indicate a recovery (Figure 3).

Whether or not this recovery is short term, or the beginning of a long term trend cannot be clearly ascertained by the trawl survey. Although it appears that the Cook Inlet trawl survey may indicate relative abundance of smaller Tanner crabs, less than 75 mm, the absolute numbers remain in question, because the probability of their capture may be substantially less than that of the larger males.

#### Kamishak and Barren Islands Districts

The legal segment of the stock in the Kamishak and Barren Islands Districts continues to be depressed. This condition is evidenced by both the data from the Cook Inlet and the

Kodiak trawl surveys: Kodiak ADF&G tows south of the latitude of Cape Douglas, and Cook Inlet ADF&G trawls north of Cape Douglas. The 243,000 crab estimate of legal males for 1995 is greater than the 183,000 estimate for 1994. These numbers, however, clearly indicate a depressed legal segment of the stock when compared to historic commercial catches that averaged approximately 700,000 crabs per season since inception of the minimum legal size in 1976.

Once again skipmolting percentages remained extremely high in the prerecruit one and two size classes. An estimated 81 percent of the prerecruit ones skipmolted in 1995. This compares to skipmolting in the prerecruit one size class in the Southern District that doesn't exceed 20 percent. The high incidence of skipmolting in 1995, in combination with the existing skipmolt prerecruit ones that did not succumb to natural mortality, produced 875,000 skipmolt prerecruit ones in the 1995 estimate.

Skipmolting in the prerecruit two size class, although significant, was not as severe as that in the prerecruit one size class. In 1995, an estimate 37 percent of the prerecruit twos skipmolted. This compares to less than 5 percent of the prerecruit twos in the Southern District.

Inspection of the 1995 survey data, as well as that from previous years, indicates an obvious bias toward the male Tanner crabs (Tables 9 and 10). Review of historical pot and trawl survey data shows that male catches always substantially exceeded females in the Kamishak survey. The explanation for this phenomenon is likely a combination of 3 factors:

- 1) Survey emphasis is on male Tanners because the data are more directly related to fishery management; thus when survey time is limited, stations historically exhibiting male catches were selected.

- 2) When bad weather causes a loss in fishing time, stations that have not shown significant male catches were eliminated from the survey.
- 3) The trawl may have physically passed over the crabs. The degree of “passing over” the crabs may be a function of both crab size and bottom type.

### Tanner Crab Summary

Over the 6 year history of the Cook Inlet crab trawl survey it has proven its utility in tracking the relative abundance of the stock. This assumption has been borne out by commercial fishery catch data as well as qualitative information provided by recreational fishermen. It appears, however, that there is substantial room for improvement that will provide a consistency among survey years. Suggested means of improvement are:

1. Utilize net acoustic gear to determine if the net is tending bottom on a consistent basis.
2. When large numbers of crabs are captured, subsample the stations ( increase the number of tows) to increase the accuracy of the estimate.

### Dungeness crab

Beginning in 1989 the Southern District trawl surveys have recognized a group of Dungeness males as they moved through the successive years. Although the survey was not designed to assess the Dungeness crab stock, the data seem to agree with the results of the Southern District Dungeness pot survey and with qualitative information provided by recreational fishermen.

The 1995 data indicate a continued reduction in the males that constituted the year class dominating the trawl survey since 1989. The magnitude of this group has declined as



both natural mortality due to old age and harvest from the recreational fishery have become significant. The 1995 data also show, however, the appearance of another size class that is not as large as the one detected in 1989, but still may provide meaningful recruitment into the legal segment of the stock in 1997 (Figure 13).

Table 1. Target species catch in pounds by station in the Southern District, Cook Inlet trawl survey, 1995.

Station no.	Tanner	Dungeness	King	Misc. invertebrates, fish & debris	Total catch
1	54	6	12	2502	2574
2	26	8	18	784	836
3	72	50	0	4096	4218
4	22	6	0	1866	1894
5	0	3	0	1265	1268
6	86	20	0	1974	2080
7	14	24	0	2246	2284
8	1078	0	12	1908	2998
9	784	0	0	1208	1992
10	28	0	0	2344	2372
11	326	0	0	2324	2650
12	54	106	0	1868	2028
13	304	0	0	1970	2274
14	2	0	0	3758	3760
15	158	0	0	3192	3350
17	0	10	0	1990	2000
18	3	8	0	837	848
20	0	4	0	1898	1902
21	2	12	0	434	448
71	308	17	0	4007	4332
----- Southern District totals -----					
20	3321	274	42	42471	46108

Table 2. Numbers of male Tanner crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1995.

Station	----- Sublegal males -----						----- Legal males -----				Total legal	Total males
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit			
			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)		
1	51	69	13	0	2	1	0	0	0	0	0	136
2	21	23	6	0	2	0	0	0	0	0	0	52
3	9	65	33	0	4	0	1	0	0	0	1	112
4	22	13	6	0	1	1	1	1	0	0	2	45
5	16	5	2	0	0	0	0	0	0	0	0	23
6	26	82	39	3	3	1	0	2	0	0	2	156
7	7	5	7	0	1	0	0	1	0	0	1	21
8	9	11	305	1	288	0	116	1	6	0	123	737
9	9	14	49	1	150	16	92	47	3	8	150	389
10	99	3	0	1	2	2	2	1	0	0	3	110
11	131	143	93	0	36	4	14	0	1	1	16	423
12	1	6	11	5	4	7	0	5	0	0	5	39
13	3	3	40	2	53	1	13	0	0	0	13	115
14	0	0	0	0	0	1	0	0	0	0	0	1
15	0	1	3	4	9	12	2	32	0	4	38	67
18	0	0	0	0	0	0	0	0	0	1	1	1
21	0	0	0	0	0	1	0	0	0	0	0	1
71	63	66	107	7	56	5	6	5	0	0	11	315
District total	467	509	714	24	611	52	247	95	10	14	366	2743

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Tanner crab catch

Table 3. Numbers of female Tanner crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1995.

----- Mature -----													
Station	Juveniles	Full clutches		Partial clutches		Barren		Total mature		Total females			
		New	Old	VO	New	Old	VO	New	Old	VO			
1	58	0	0	0	0	0	0	0	0	0	58		
2	47	0	0	0	0	0	0	0	0	0	47		
3	33	0	0	0	0	0	0	0	0	0	33		
4	23	0	0	0	0	0	0	0	0	0	23		
5	19	0	0	0	0	0	0	0	0	0	19		
6	60	0	0	0	0	0	0	0	0	0	60		
7	12	0	0	0	0	0	0	0	0	0	12		
8	43	435	6	1	6	0	0	441	6	7	497		
9	18	27	2	18	0	0	0	27	2	24	71		
10	125	4	0	0	0	0	0	4	0	0	129		
11	172	117	3	0	0	0	0	117	3	0	292		
12	1	1	9	3	0	0	0	1	9	3	14		
13	4	224	4	12	0	0	4	224	4	16	248		
15	0	4	7	13	0	1	1	4	8	14	26		
18	0	0	1	0	0	0	0	0	1	0	1		
71	218	56	0	7	2	0	6	60	0	25	303		
District total	833	868	32	54	8	1	11	878	33	89	1833		

-note- stations not listed had no female Tanner crab catch

Table 4. Numbers of male king crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1995.

Station	Sublegal males				Legal males				Total legal males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	
1	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	0	1	1
District total	0	0	0	0	0	0	0	1	3

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male king crab catch

Table 5. Numbers of female king crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1995.

----- Mature -----													
Station	Juveniles	Full clutches		Partial clutches		Barren		Total mature		Total females			
		New	Old	VO	New	Old	VO	New	Old	VO			
2	0	0	0	0	0	0	0	1	0	0			1
District total	0	0	0	0	1	0	0	1	0	0			1

-note- stations not listed had no female king crab catch

Table 6. Numbers of male Dungeness crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1995.

Station	Sublegal males						Legal males				Total legal	Total males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	Postrecruit (new)	Postrecruit (old)		
1	0	0	1	0	1	0	0	1	0	0	1	3
2	0	0	0	0	0	0	0	2	0	0	2	2
3	0	0	17	0	17	0	2	2	0	0	4	38
4	0	0	3	0	1	0	0	0	0	0	0	4
5	0	0	1	1	1	0	0	0	0	0	0	3
6	0	0	2	0	2	0	1	0	0	0	1	5
7	0	1	1	0	1	1	1	0	0	0	1	5
12	0	1	71	0	21	0	0	0	0	0	0	93
17	0	0	0	0	0	1	1	0	0	0	1	2
71	0	0	1	0	2	1	0	0	0	0	0	4
District total	0	2	97	1	46	3	5	5	0	0	10	159

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Dungeness crab catch

Table 7. Numbers of female Dungeness crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1995.

Station	Juveniles	----- Mature -----										Total females
		Full clutches		Partial clutches		Barren		Total mature		VO		
		New	Old	VO	New	Old	VO	New	Old			
1	0	0	0	0	0	0	1	0	0	0	1	
2	0	0	0	0	0	0	3	0	0	0	3	
3	0	0	0	0	0	0	14	0	0	0	14	
4	0	0	0	0	0	0	2	0	0	0	2	
5	0	0	0	0	0	0	1	0	0	0	1	
6	0	0	0	0	0	0	16	0	0	0	16	
7	0	1	0	0	0	0	17	1	0	0	19	
12	0	0	0	0	0	0	13	0	0	0	21	
17	0	0	0	0	0	0	3	3	0	0	6	
18	0	0	0	0	0	0	7	0	0	0	7	
20	0	0	0	0	0	0	1	3	0	0	4	
21	0	0	0	0	0	0	9	1	0	0	10	
71	0	0	0	1	0	0	18	2	0	1	21	
District total	0	8	1	1	0	0	105	10	0	11	1	125

-note- stations not listed had no female Dungeness crab catch



Table 14. Tanner crab catch (pounds) by season, Cook Inlet Management Area, 1968-1995.

Season	Southern	Vessels	Kamishak/ Barren Is.	Vessels	Outer/ Eastern	Vessels	Central	Vessels	Total catch	Total vessels
1968-69	1,388,282		12,398		816				1,401,496	
1969-70	1,147,154		71,196		104,191				1,322,541	
1970-71	1,046,803		541,212		3,000				1,591,015	
1971-72	2,462,956		974,962		804,765				4,242,683	
1972-73	2,935,662		3,361,023		1,266,023				7,562,708	
1973-74	1,387,535		4,689,251		1,891,021				7,967,807	
1974-75	967,762		2,150,462		656,660				3,774,884	
1975-76	1,339,245		3,281,084	17	850,964				5,471,293	57
1976-77	2,009,633	35	1,765,926	24	824,520				4,600,079	67
1977-78	2,806,568	55	2,077,092	28	502,049				5,385,709	92
1978-79	2,323,420	75	2,713,339	27	694,728				5,731,487	77
1979-80	1,134,940	68	3,338,623	24	595,645				5,069,208	68
1980-81	1,047,630	46	1,757,331	20	463,201				3,268,162	52
1981-82	548,529	41	1,286,332	18	524,897	9			2,359,758	51
1982-83	584,908	48	1,693,794	20	682,919	20			2,961,621	65
1983-84	996,763	45	1,373,674	17	443,384	14			2,813,821	71
1984-85	1,229,298	83	1,535,547	19	259,083	7			3,023,928	86
1985-86	1,164,261	103	1,288,711	24	177,041	5			2,630,013	109
1987	1,077,379	87	1,111,339	21	251,174	13	7,771	2	2,447,663	95
1988	944,763	127	417,182	24	168,969	23	8,396	3	1,539,310	137
1989	CLOSED	--	CLOSED	--	CLOSED	--	CLOSED	--	0	--
1990	CLOSED	--	422,037	7	CLOSED	--	CLOSED	--	422,037	7
1991	271,379	68	266,106	8	CLOSED	--	CLOSED	--	537,485	71
1992	354,868	110	CLOSED	--	53,049	16	CLOSED	--	407,917	121
1993	534,003	136	CLOSED	--	CLOSED	--	CLOSED	--	534,003	136
1994	284,676	110	CLOSED	--	CLOSED	--	CLOSED	--	284,676	110
1995	CLOSED	--	CLOSED	--	CLOSED	--	CLOSED	--	CLOSED	--
Average	1,082,064	77	1,509,645	20	433,897	13	8,084	3	2,594,404	83

a/ Since inception of minimum legal size between the 1976-77 season.  
Does not include closed seasons.

Table 8. Target species catch in pounds by station in the Kamishak District, Cook Inlet trawl survey, 1995.

Station no.	Tanner	Dungeness	King	Misc. invertebrates, fish & debris	Total catch
23	0	0	0	666	666
27	6	0	0	1374	1380
28	22	0	0	644	666
29	2	0	0	356	358
31	2	0	0	966	968
32	51	0	0	607	658
33	21	0	0	873	894
34	2	0	0	758	760
37	130	0	15	661	806
38	0	0	0	852	852
41	142	0	0	368	510
43	3	0	0	383	386
44	228	0	0	972	1200
45	3	0	8	885	896
47	47	0	0	553	600
48	1	0	1	610	612
49	2	0	0	990	992
50	18	0	0	778	796
51	63	0	0	873	936
52	0	0	0	1604	1604
53	84	0	3	465	552
54	152	0	1	239	392
56	2	0	0	1534	1536
58	44	0	0	434	478
60	3	0	0	1007	1010
67	7	0	0	459	466
68	6	0	0	880	886
----- Kamishak District totals -----					
27	1041	0	28	20791	21860

Table 9. Numbers of male Tanner crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1995.

Station	Sublegal males						Legal males				Total legal	Total males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	Postrecruit (new)	Postrecruit (old)		
27	1	0	2	1	0	3	0	0	0	0	0	7
28	0	5	8	5	3	5	0	0	0	0	0	26
31	0	0	0	0	0	1	0	0	0	0	0	1
32	3	7	3	26	0	21	0	0	0	0	0	60
33	0	4	5	6	1	9	0	0	0	0	0	25
34	0	0	0	1	0	1	0	0	0	0	0	2
37	0	29	34	28	8	25	0	5	0	0	5	129
41	0	2	19	5	68	4	13	0	0	0	13	111
43	1	0	1	0	5	0	0	0	0	0	0	7
44	0	0	9	40	17	98	4	4	0	0	8	172
45	0	0	1	0	0	2	0	0	0	0	0	3
47	4	7	28	6	9	2	4	0	0	0	4	60
48	0	0	0	0	0	1	0	0	0	0	0	1
49	0	0	0	0	0	0	1	0	0	0	1	1
50	0	0	1	2	1	9	1	0	0	0	1	14
51	0	0	1	2	20	22	1	5	0	0	6	51
53	0	1	16	0	43	2	7	0	0	0	7	69
54	2	59	140	7	57	14	15	0	0	0	15	294
56	0	0	0	0	0	1	0	0	0	0	0	1
58	1	21	18	1	6	5	1	0	0	0	1	53
60	0	1	0	0	0	0	0	1	0	0	1	2
67	0	2	4	2	0	2	0	2	0	0	2	12
68	0	0	0	0	0	2	0	1	0	0	1	3
District total	12	138	290	132	238	229	47	18	0	0	65	1104

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Tanner crab catch

Table 10. Numbers of female Tanner crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1995.

----- Mature -----														
Station	Juveniles	Full clutches			Partial clutches			Barren			Total mature			Total females
		New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	
27	1	0	0	0	0	0	0	0	0	0	0	0	0	1
28	11	7	0	0	0	0	0	0	0	0	7	0	0	18
29	0	1	0	0	0	0	0	0	0	0	1	0	0	1
32	3	0	0	0	0	0	0	0	0	0	0	0	0	3
33	3	2	0	0	0	0	0	0	0	0	2	0	0	5
37	1	44	5	9	0	0	0	0	0	0	44	5	9	59
44	0	1	15	0	0	0	0	0	0	0	1	15	0	16
45	1	1	0	0	0	0	0	0	0	0	1	0	0	2
47	3	2	0	0	0	0	0	0	0	0	2	0	0	5
50	0	0	5	1	0	0	0	0	0	0	0	5	1	6
51	0	0	1	0	0	0	0	0	0	0	0	1	0	1
54	18	31	0	0	0	0	0	0	0	0	31	0	0	49
58	14	9	0	1	0	0	0	0	0	0	9	0	1	24
60	0	0	1	1	0	0	0	0	0	0	0	1	1	2
67	4	0	0	0	0	0	0	0	0	0	0	0	0	4
District total	59	98	27	12	0	0	0	0	0	0	98	27	12	196

-note- stations not listed had no female Tanner crab catch

Table 11. Numbers of male king crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1995.

Station	Sublegal males				Legal males			Total legal males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	
37	1	0	0	0	0	0	1	2
45	0	0	0	0	0	0	0	1
53	0	2	0	0	0	0	0	0
District total	1	2	0	0	0	0	1	3

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

Station	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male king crab catch

Table 12. Numbers of female king crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1995.

Station	Juveniles	Mature -----									
		Full clutches		Partial clutches		Barren		Total mature		Total females	
		New	Old	VO	New	Old	VO	New	Old	VO	
37	1	0	0	0	0	0	0	0	0	0	1
48	1	0	0	0	0	0	0	0	0	0	1
53	1	0	0	0	0	0	0	0	0	0	1
54	1	0	0	0	0	0	0	0	0	0	1
District total	4	0	0	0	0	0	0	0	0	0	4

-note- stations not listed had no female king crab catch

Table 13. Tanner crab population estimates in numbers by sex, size and age classes, 1995 Cook Inlet trawl survey.

Males	Southern District	Kamishak and Barren Is. District
<u>Sublegal</u>		
< 70 mm	372,035	47,256
70 - 91 mm	356,327	422,861
91 - 144 mm		
new	449,225	841,368
o & vo	17,330	502,175
115 - 139 mm		
new	386,004	733,399
o & vo	37,399	875,308
<u>Legal</u>		
140 - 164 mm		
new	157,383	171,912
o & vo	62,421	71,418
> 166 mm		
new	6,049	0
o & vo	9,466	0
<u>Total legals</u>	235,319	243,330
<u>Total males</u>	1,853,639	3,665,697
<u>FEMALES</u>		
Juveniles	609,577	195,451
Adults	676,352	479,970
<u>Total females</u>	1,285,929	675,421

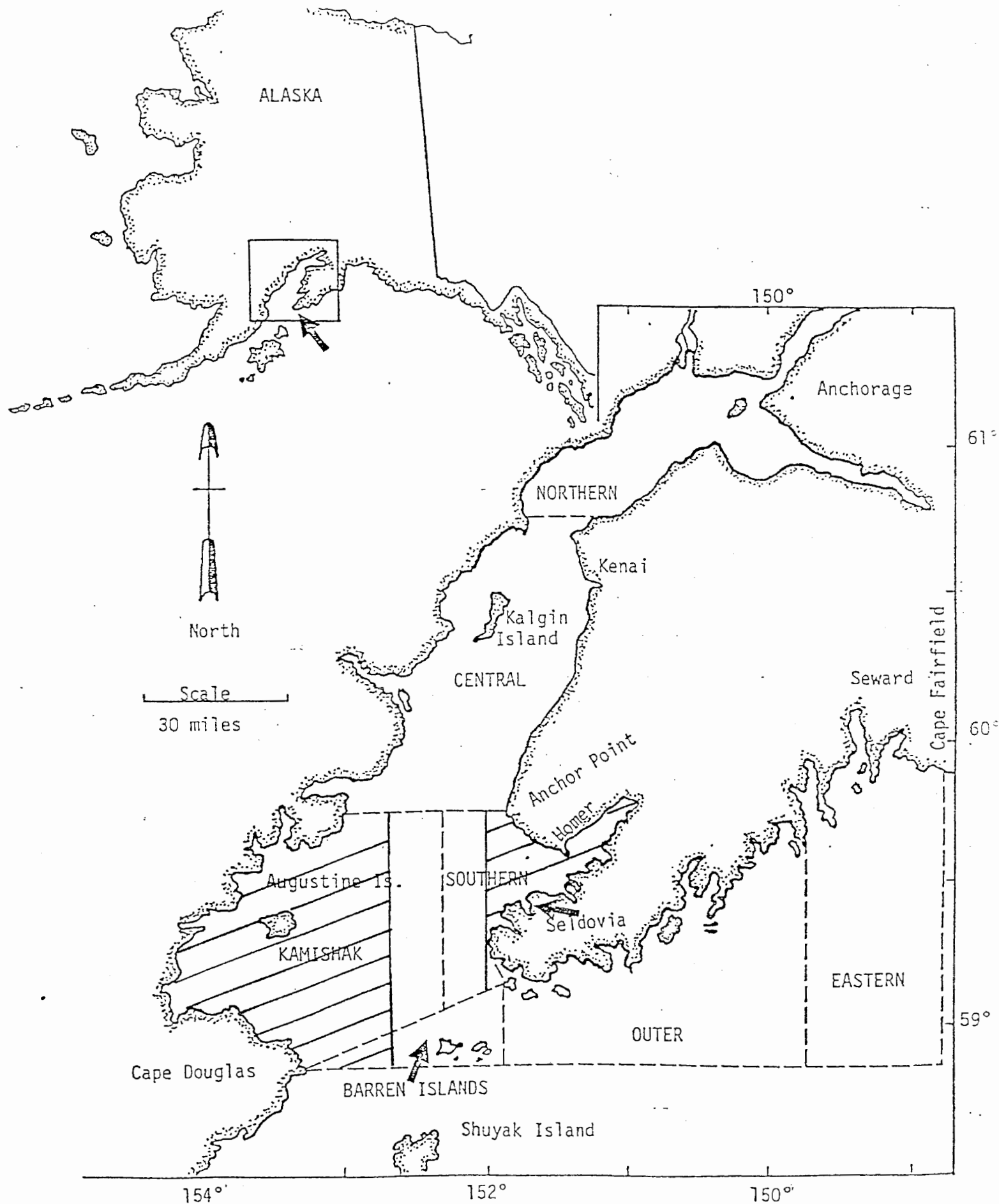
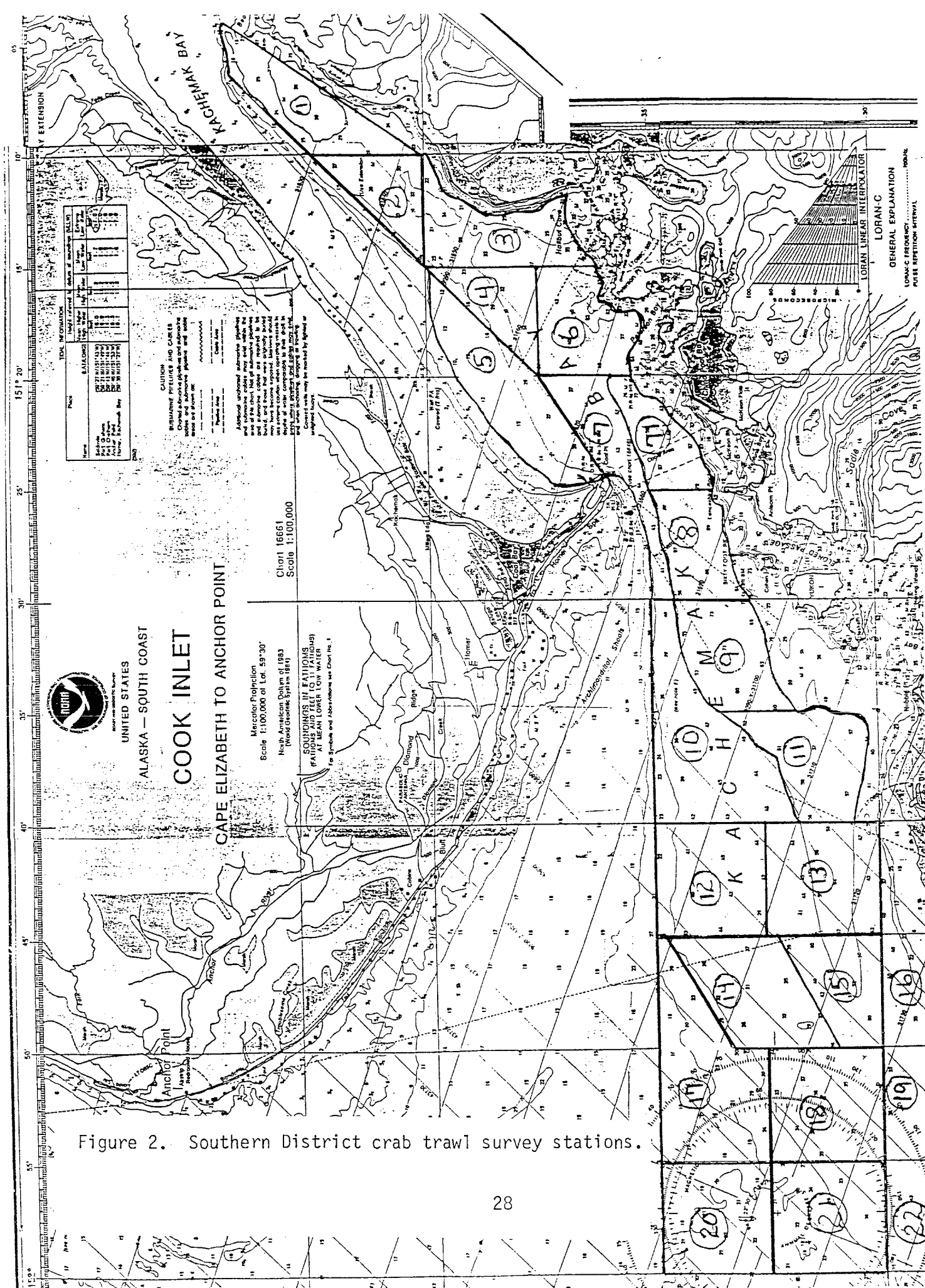


Figure 1. Cook Inlet Management Area and trawl survey locations





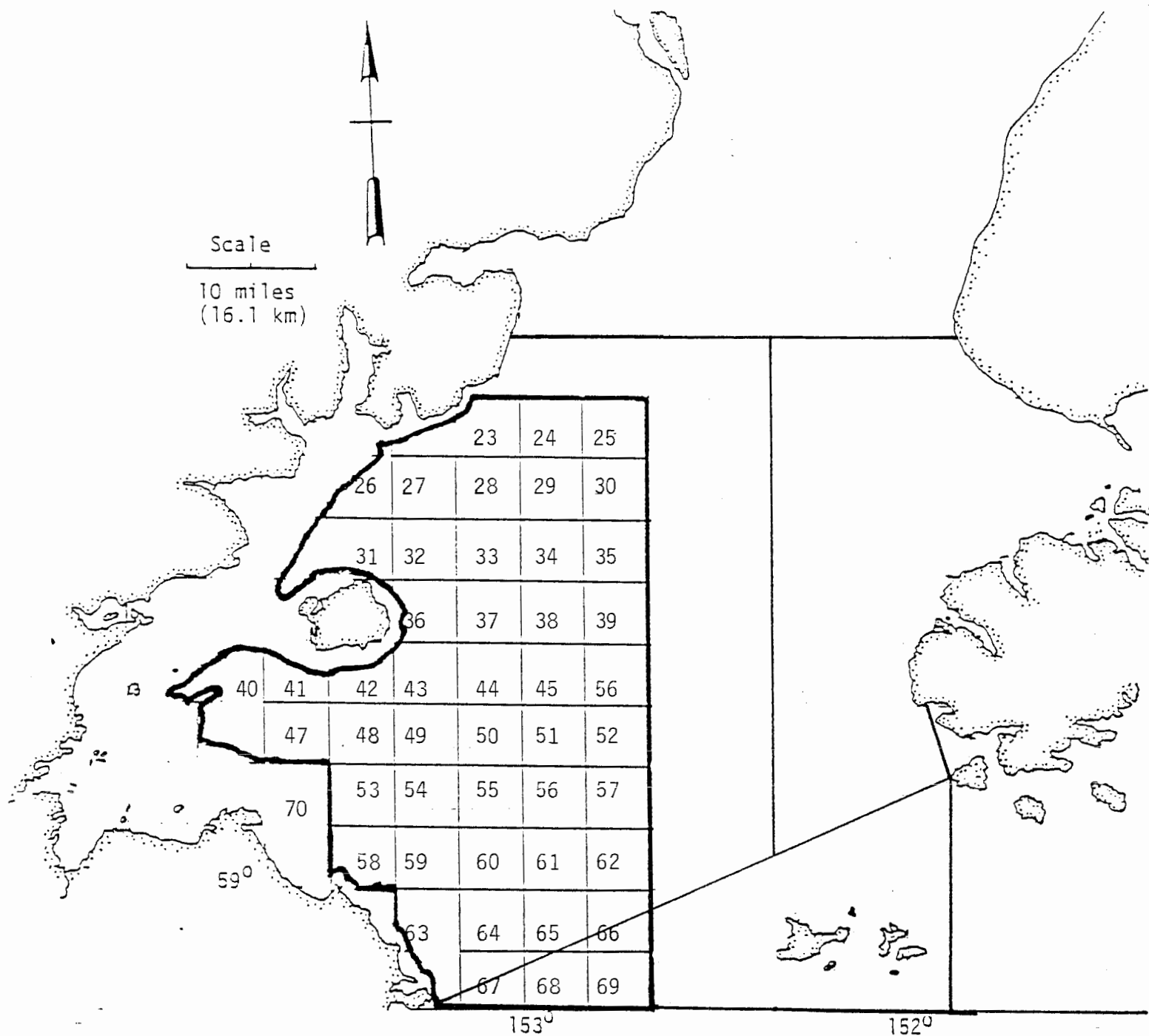


Figure 3. Kamishak and Barren Islands Districts crab trawl survey stations.

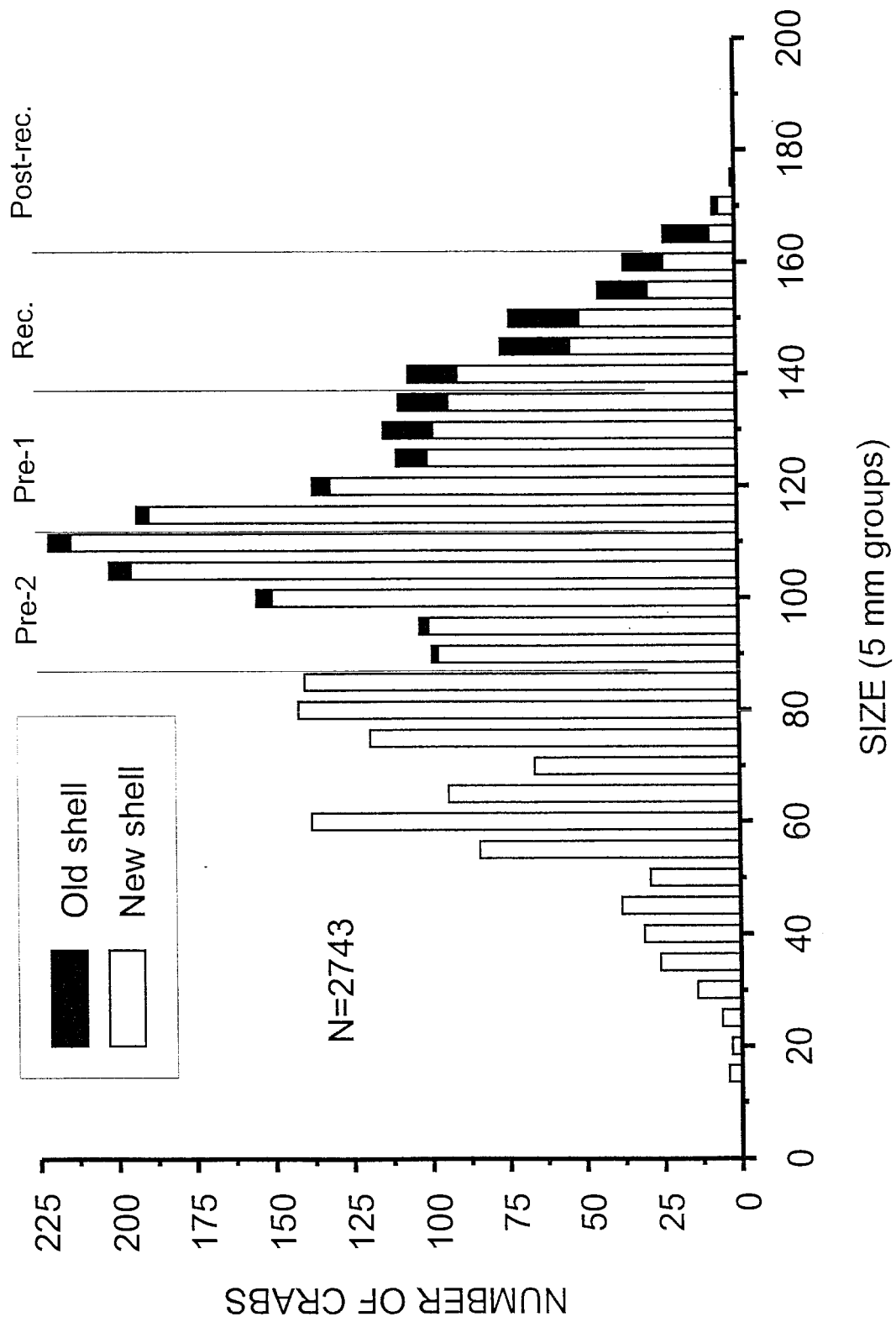


Figure 4. Male Tanner crab catch, Southern Distr., 1995 Cook Inlet trawl survey.

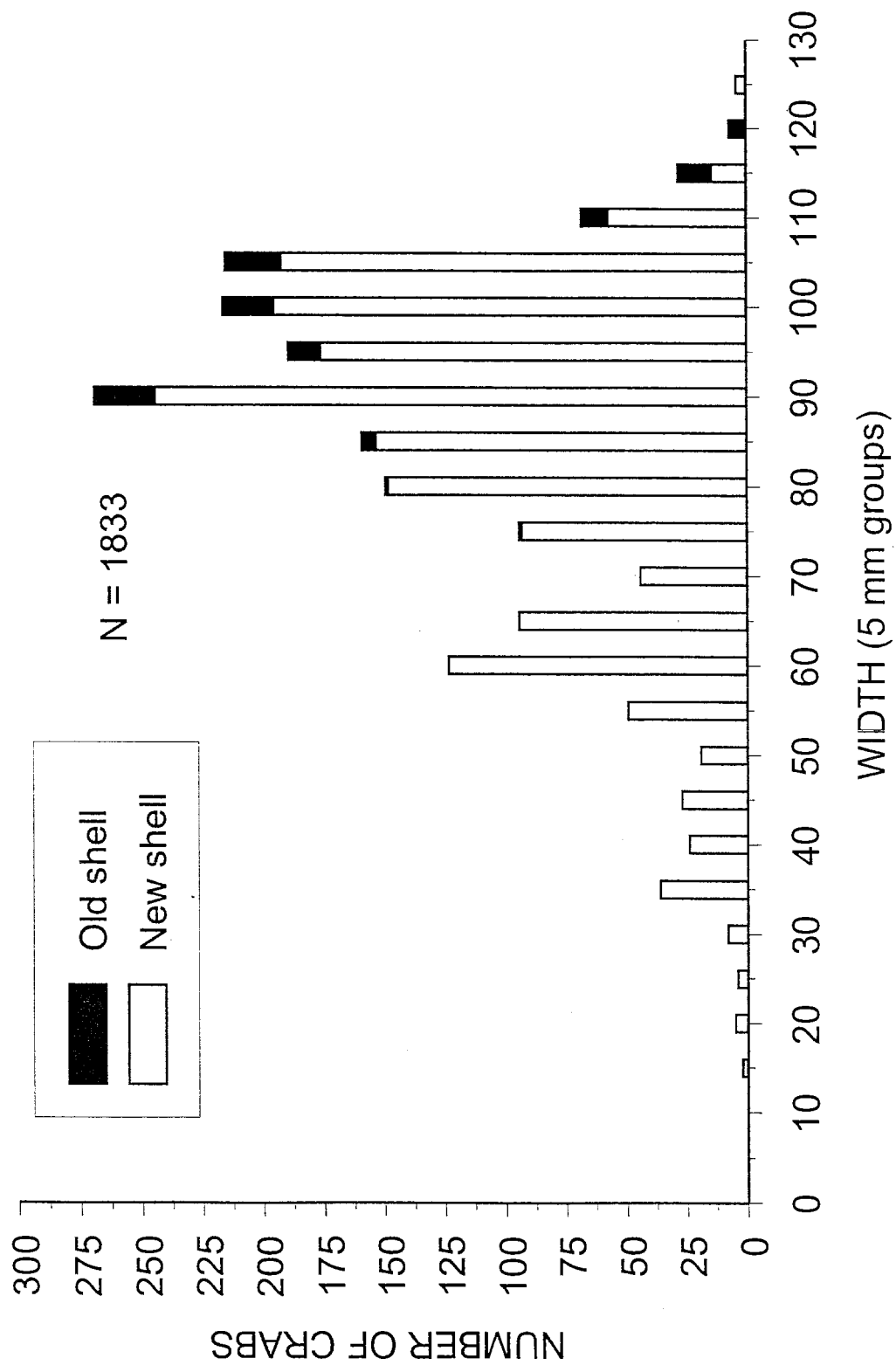


Figure 5. Female Tanner crab catch, Southern Distr., 1995 Cook Inlet trawl survey.

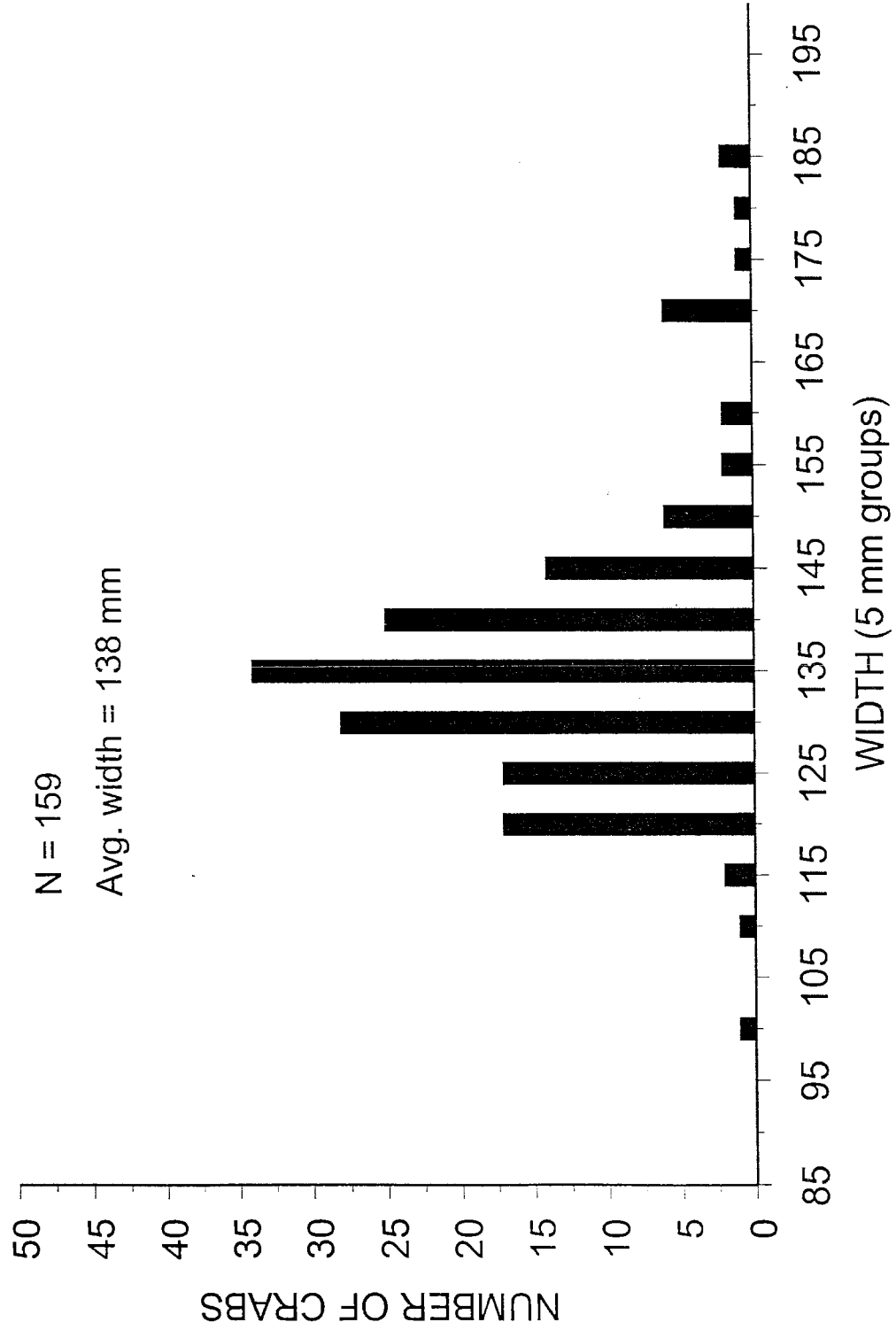


Figure 6. Male Dungeness catch, July, 1995 Southern Distr. crab trawl survey

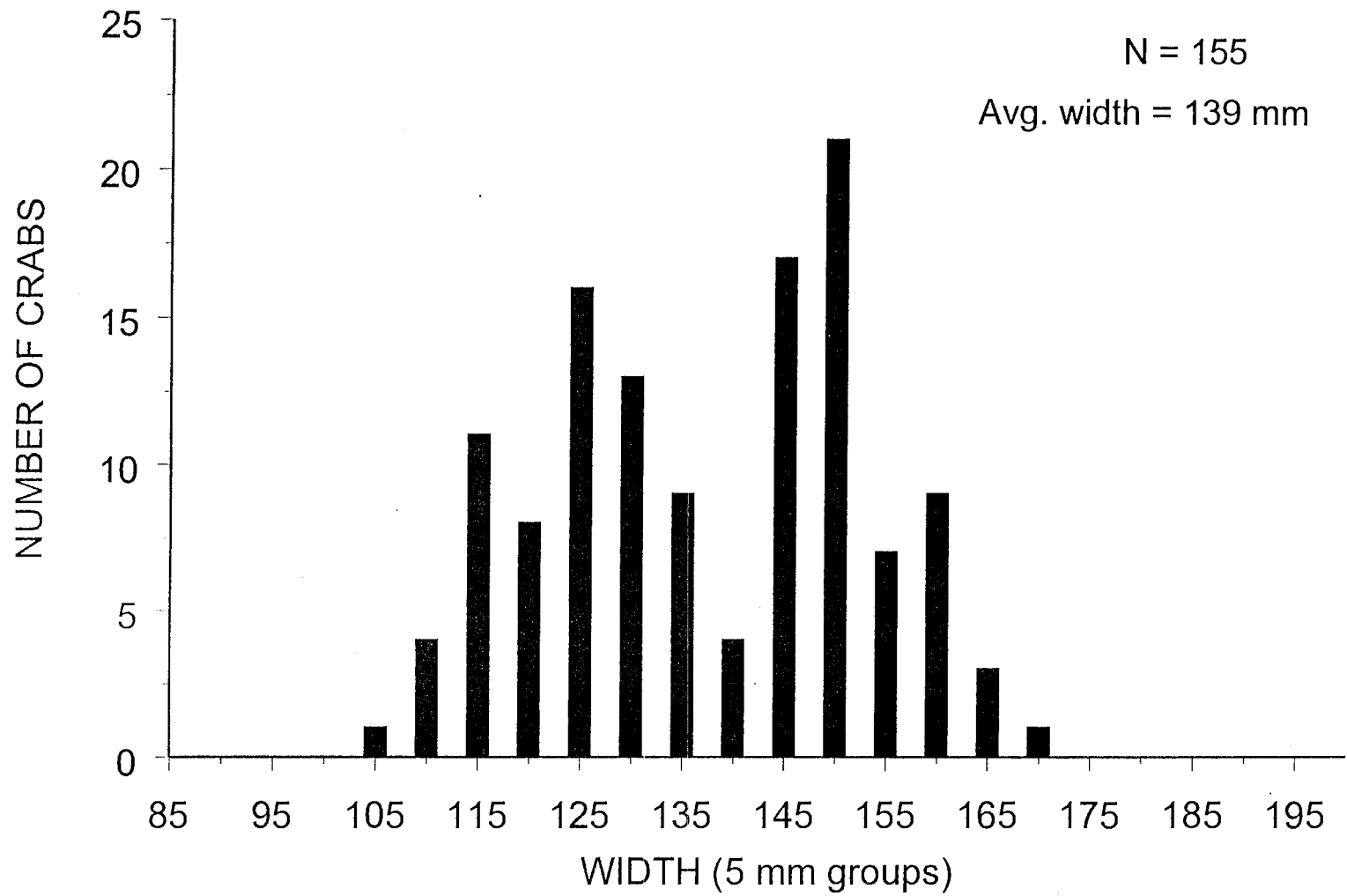


Figure 7. Female Dungeness catch, July, 1995 Southern Distr. crab trawl survey.

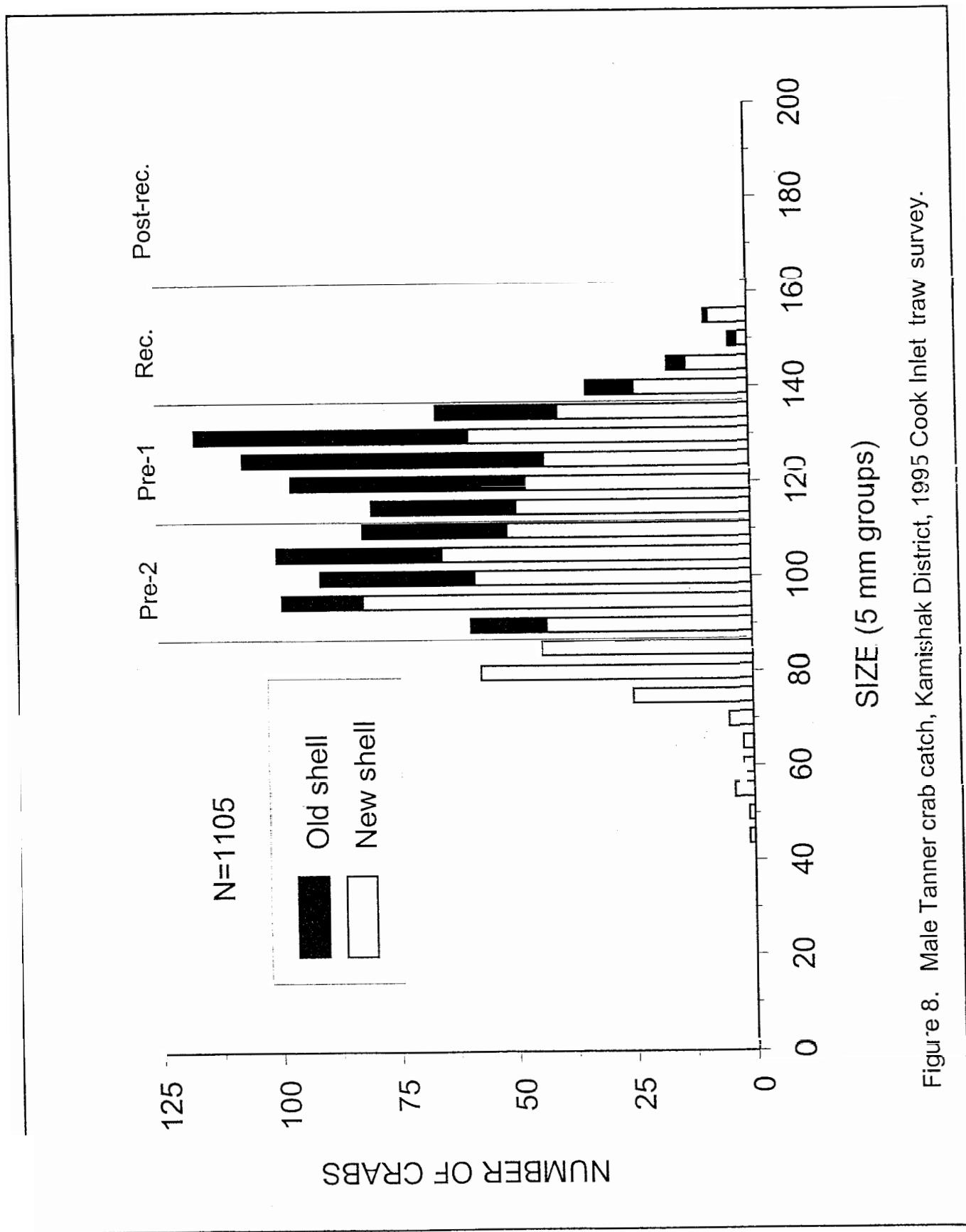


Figure 8. Male Tanner crab catch, Kamishak District, 1995 Cook Inlet traw survey.

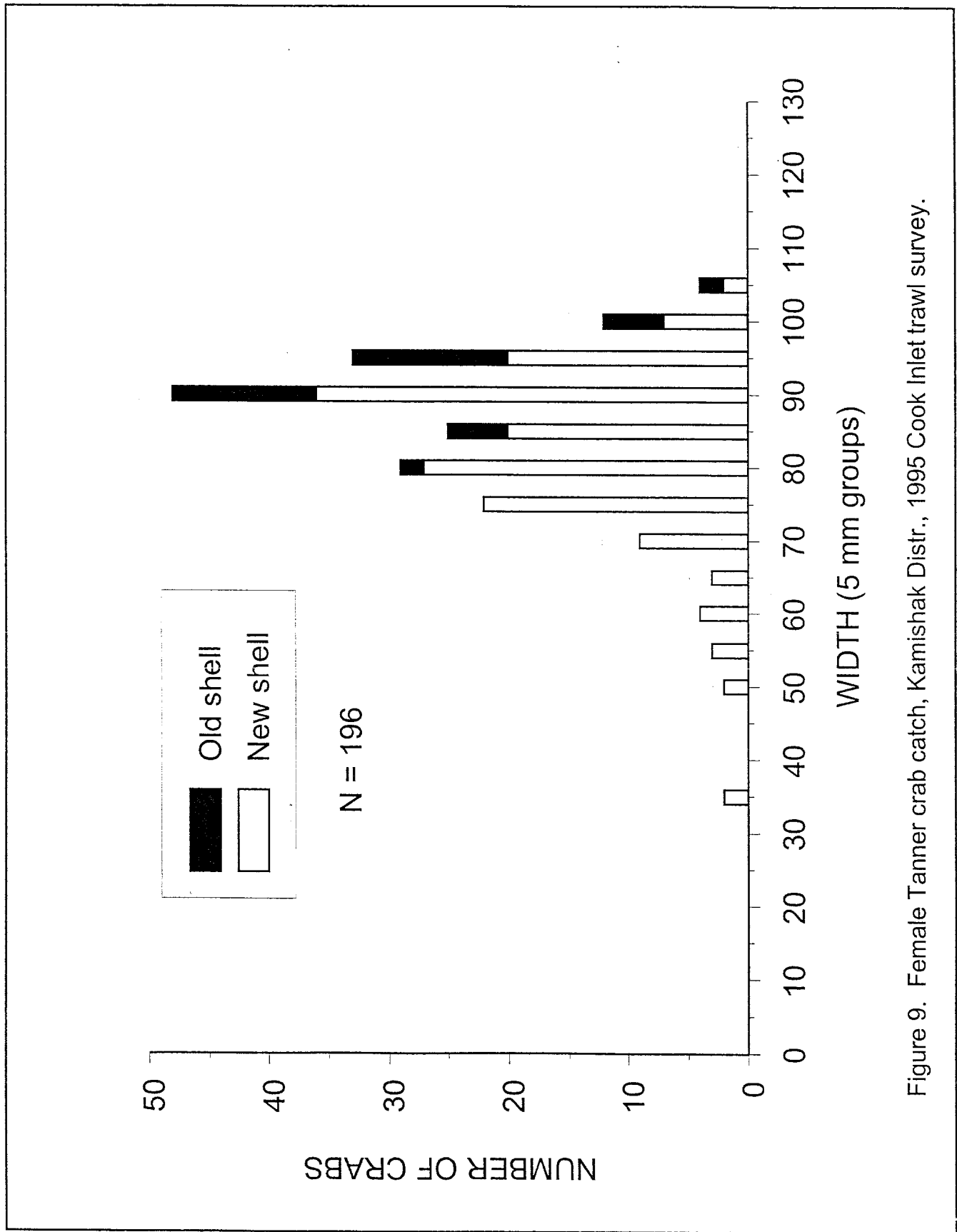


Figure 9. Female Tanner crab catch, Kamishak Distr., 1995 Cook Inlet trawl survey.



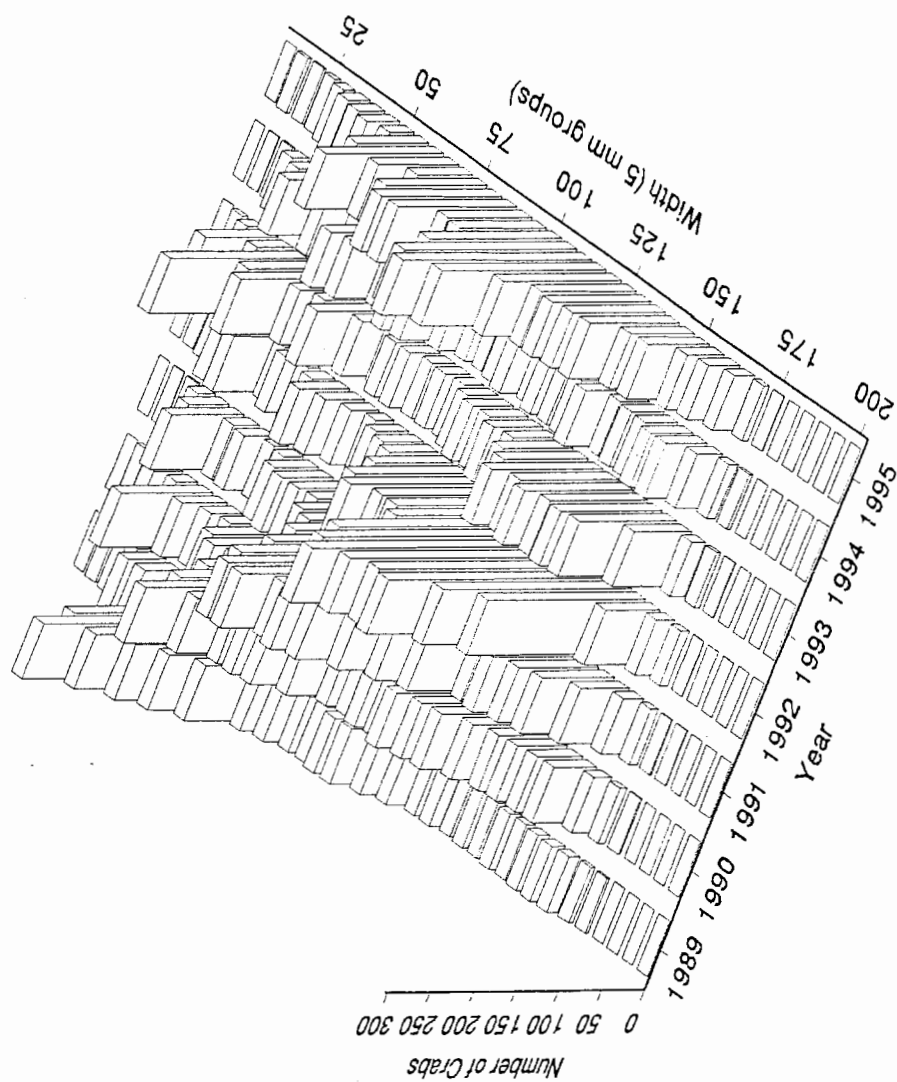


Figure 10. Male Tanner catch, 1989-1995, Southern Distr. trawl surveys.

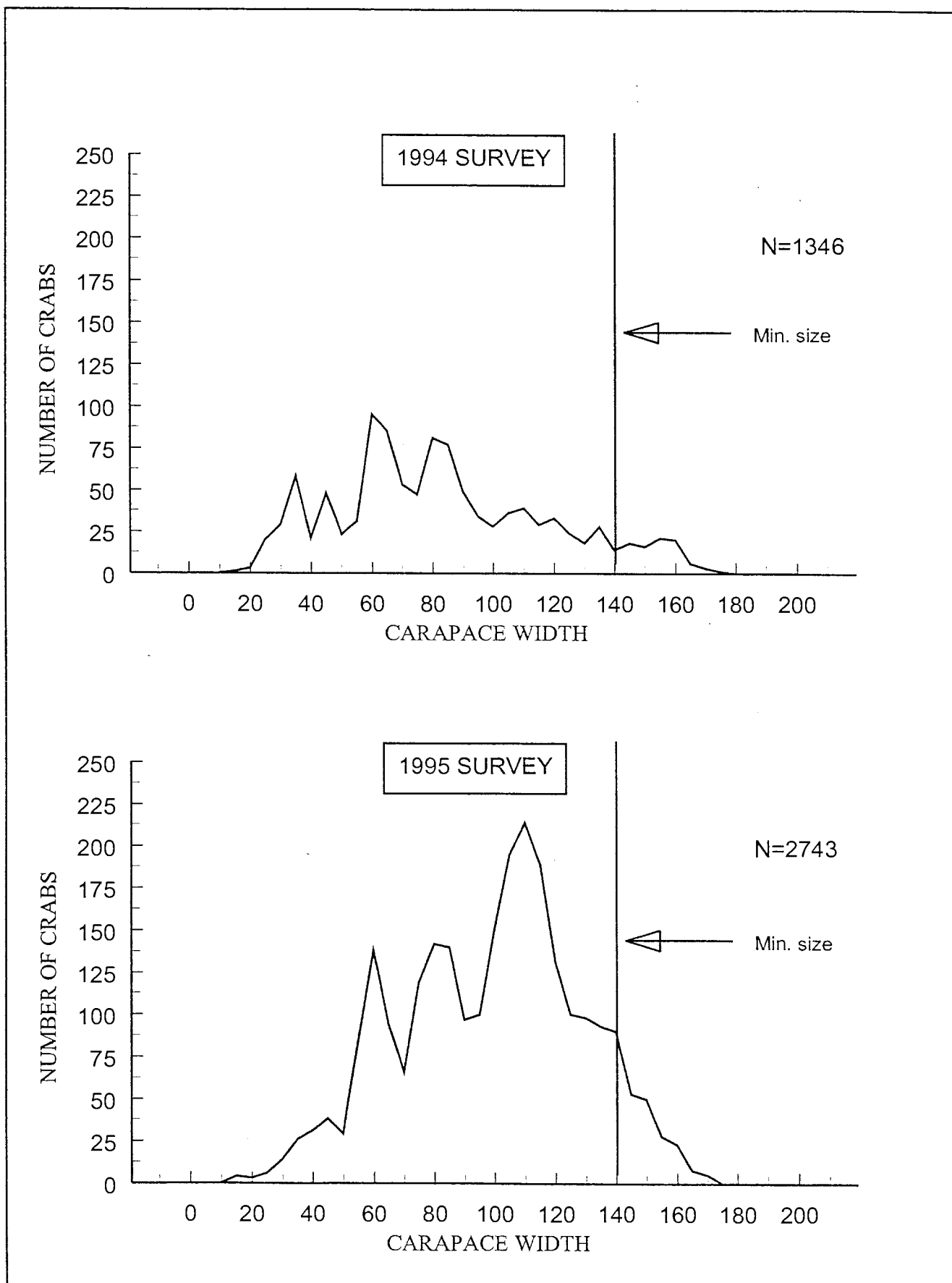


Figure 11. Comparison of male Tanner catch, 1994 and 1995 Southern Distr. trawl surveys.

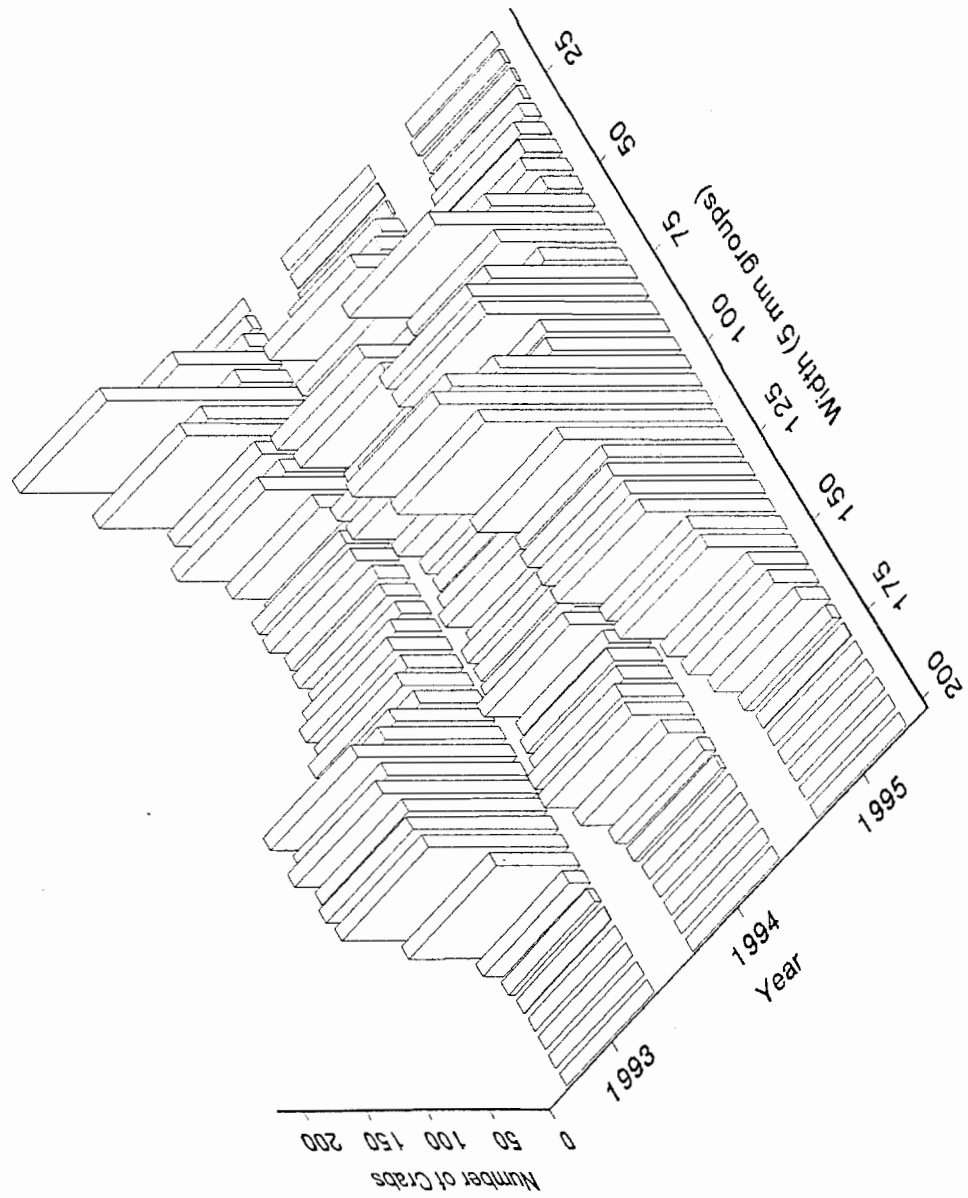


Figure 12. Male Tanner catch, 1993-1995, Southern Distr. trawl surveys.

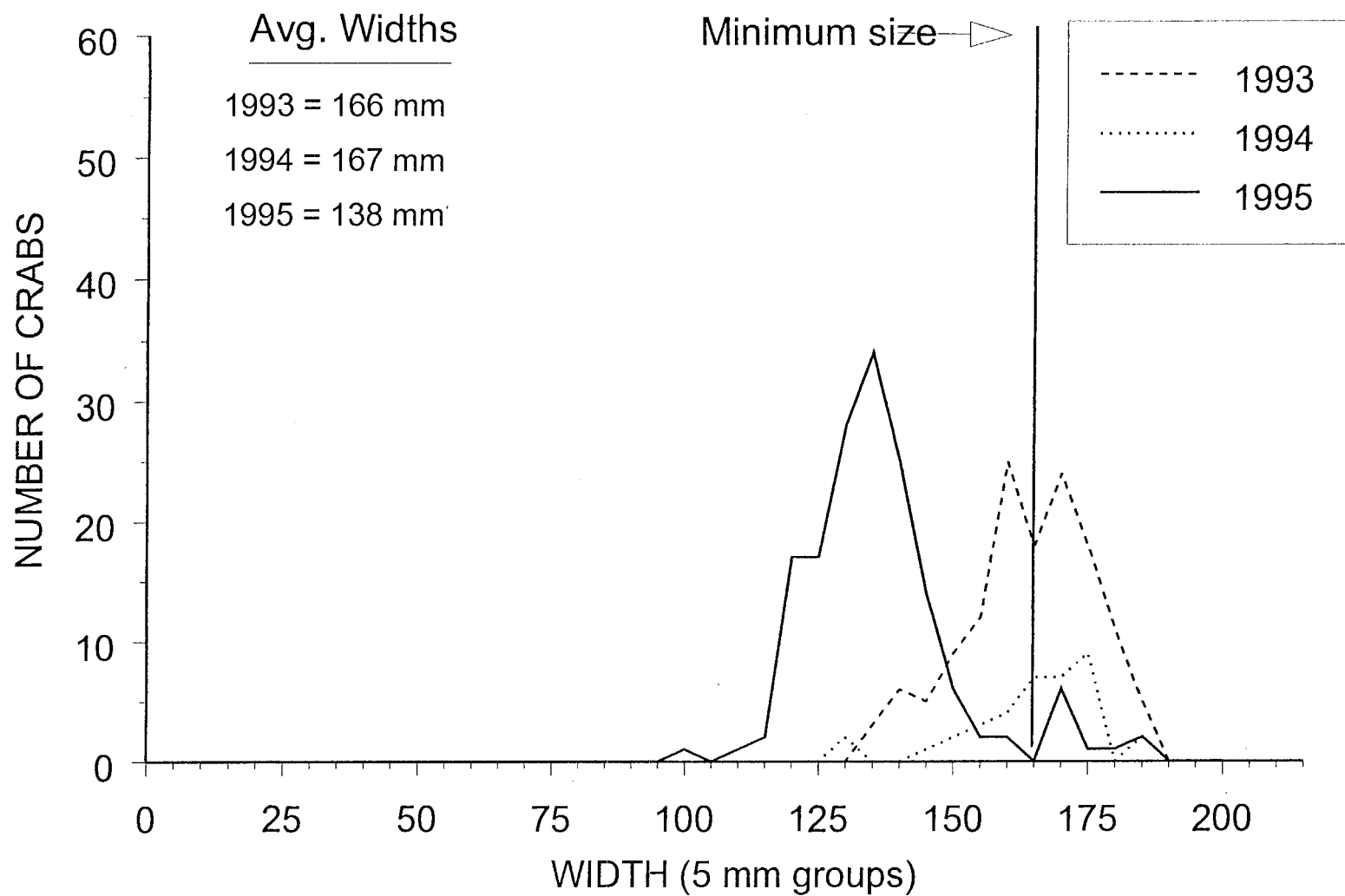


Figure 13. Male Dungeness catch, Southern District trawl survey, 1993 - 1995.

Appendix A. Fishing log and catch (lbs.) by station in the Southern District, 1995 Cook Inlet trawl survey.

Station	Area (sqnm)	Date	Latitude (start)		Longitude (start)		Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
1	4.98	07/06/95	59	41.89	151	09.99	10	27	1.00	32	40	2574
2	2.92	07/06/95	59	40.55	151	12.37	20	26	1.00	28	28	836
3	5.52	07/06/95	59	37.58	151	15.58	10	27	1.00	33	37	4218
4	3.08	07/05/95	59	37.70	151	19.21	27	28	1.00	30	32	1894
5	5.94	07/05/95	59	38.28	151	20.62	26	27	1.00	15	16	1268
6	5.	07/06/95	59	36.86	151	19.73	25	28	1.00	38	38	2080
7	3.93	07/06/95	59	37.19	151	20.64	200	28	1.00	33	35	2284
8	3.57	07/09/95	59	33.32	151	29.99	30	27	1.00	90	94	2998
9	4.59	07/07/95	59	33.11	151	33.71	35	29	1.00	66	67	1992
10	8.52	07/07/95	59	33.53	151	37.73	45	28	1.00	48	49	2372
11	4.63	07/07/95	59	31.53	151	39.96	45	30	1.00	57	58	2650
12	6.25	07/08/95	59	32.83	151	44.19	50	28	1.00	40	44	2028
13	6.25	07/09/95	59	31.24	151	44.03	65	28	1.00	58	59	2274
14	6.64	07/08/95	59	34.36	151	45.34	200	15	0.50	35	36	3760
15	3.68	07/10/95	59	31.35	151	46.19	215	30	1.00	39	39	3350
17	8.94	07/10/95	59	33.26	151	51.45	200	25	1.00	27	27	2000
18	6.25	07/10/95	59	31.47	151	50.91	203	29	1.00	36	36	848
20	6.25	07/10/95	59	33.92	151	55.52	195	27	1.00	20	22	1902
21	6.25	07/10/95	59	31.36	151	54.29	195	30	1.00	35	39	448
71	3.42	07/08/95	59	35.19	151	22.98	38	27	1.00	53	78	4332

Number of stations: 20  
Total area (sqnm): 106.61  
Total catch (lbs): 46108

Appendix B. Fishing log and catch (lbs.) by station in the Kamishak District, 1995 Cook Inlet trawl survey.

Station	Area (sqnm)	Date	Latitude (start)		Longitude (start)		Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
23	32.18	06/24/95	59	36.98	153	05.90	20	26	1.00	15	16	666
27	26.12	06/23/95	59	31.98	153	14.54	280	30	1.00	13	14	1380
28	26.12	06/18/95	59	31.68	153	06.13		26	1.00	18	20	666
29	26.12	06/24/95	59	33.02	152	56.67	115	32	1.00	22	22	358
31	39.	06/23/95	59	29.26	153	25.37	130	28	1.00	13	14	968
32	26.12	06/18/95	59	26.76	153	14.91	220	30	1.00	19	21	658
33	26.12	06/18/95	59	27.71	153	08.22	100	27	1.00	21	22	894
34	26.12	06/19/95	59	27.02	152	56.39	115	26	1.00	26	28	760
37	26.12	06/19/95	59	21.92	153	03.61	260	26	1.00	25	26	806
38	26.12	06/19/95	59	22.46	152	56.40	35	31	1.00	30	32	852
41	16.84	06/23/95	59	16.38	153	35.70	80	28	1.00	16	16	510
43	25.14	06/23/95	59	16.87	153	14.52	85	21	0.75	23	27	386
44	26.12	06/20/95	59	18.73	153	06.49	30	27	1.00	30	30	1200
45	26.12	06/19/95	59	17.55	152	55.90	35	26	1.00	41	45	896
47	26.12	06/22/95	59	13.40	153	36.49	135	25	1.00	18	19	600
48	26.12	06/22/95	59	11.07	153	23.19	300	31	1.00	20	21	612
49	26.12	06/22/95	59	11.63	153	14.20	5	27	1.00	29	29	992
50	26.12	06/20/95	59	12.42	153	04.92	20	28	1.00	39	40	796
51	26.12	06/20/95	59	12.49	152	55.84	95	20	0.80	61	67	936
52	26.12	06/20/95	59	13.88	152	47.19	70	26	1.00	63	63	1604
53	26.12	06/22/95	59	08.59	153	28.08	120	28	1.00	24	24	552
54	26.12	06/22/95	59	07.21	153	16.65	0	18	0.65	25	25	392
56	26.12	06/20/95	59	06.80	152	54.56	310	27	1.00	78	79	1536
58	24.74	06/21/95	59	03.20	153	26.44	310	25	1.00	22	23	478
60	26.12	06/21/95	59	03.06	153	05.29	25	26	1.00	74	76	1010
67	26.12	06/21/95	58	53.02	153	07.13	320	15	0.50	93	94	466
68	26.12	06/21/95	58	53.60	152	56.58	235	30	1.00	89	90	886

Number of stations: 27  
 Total area (sqnm): 712.54  
 Total catch (lbs): 21860

Appendix C. Data logger temperature recordings from the 1992-95 Cook Inlet Crab trawl surveys.

Date	Station	Temp. (°C)	Depth (fm)
KAMISHAK DISTRICT			
7/19/92	61	6.7	82
7/20/92	67	6.3	90
7/21/92	53	9.3	24
	Avg. =	7.4	65
6/28/93	53	8.2	22
6/29/93	31	10.2	12
6/30/93	67	5.5	92
7/1/93	54	8.8	23
7/3/93	44	8.0	26
	Avg. =	8.1	35
6/14/94	67	5.9	89
6/17/94	38	6.8	29
6/19/94	47	7.4	18
6/20/94	51	7.1	55
	Avg. =	6.8	48
6/19/95	34	7.9	27
6/20/95	44	7.4	30
6/21/95	67	7.1	94
6/22/95	47	5.9	19
6/23/95	41	7.2	16
6/24/95	23	7.1	16
	Avg. =	7.1	34
SOUTHERN DISTRICT			
7/15/92	4	7.5	32
7/16/92	7	7.5	37
7/17/92	10	7.8	47
7/18/92	11	7.9	55
	Avg. =	7.7	43

Appendix C. Continued.

7/6/93	5	6.9	16
7/7/93	4	6.7	34
7/8/93	8	6.6	67
7/12/93	7	7.1	39
7/13/93	18	8.4	36
7/14/93	15	7.6	41
	Avg. =	7.2	39
6/27/94	3	6.3	30
6/28/94	5	6.4	22
6/28/94	8	6.0	81
6/30/94	11	6.5	54
7/5/94	13	6.5	57
7/6/94	18	7.4	35
	Avg. =	6.5	34
7/5/95	5	6.3	16
7/6/95	2	5.7	28
7/7/95	10	6.4	49
7/8/95	71	6.3	66
7/9/95	8	6.0	92
7/10/95	15	7.4	39
	Avg. =	6.4	48



## ***E.E.O. STATEMENT***

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